

***Chaetocladius coppai* sp. nov. and *C. diai* sp. nov., two mountain species inhabiting glacial springs and cold streams of the Alps and Lebanon (Diptera: Chironomidae, Orthoclaadiinae)**

***Chaetocladius coppai* sp. nov. и *C. diai* sp. nov., два горных вида из ледниковых родников и холодных ручьёв Альп и Ливана (Diptera: Chironomidae, Orthoclaadiinae)**

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Two new species of the genus *Chaetocladius* are described, *C. (s. str.) coppai* sp. nov. as male adult and *C. (s. str.) diai* sp. nov. as male adult and pupa. The descriptions are based on the material collected at glacial alpine springs and small streams located in the Maritime French Alps and the Swiss Alps for *C. coppai* sp. nov., and the Mount Lebanon range for *C. diai* sp. nov. According to the characters of the adult males, *C. coppai* sp. nov. belongs to the *laminatus*-group, while *C. diai* sp. nov. is close to *C. elegans* Makarchenko et Makarchenko, 2001. The comments on the taxonomic position, ecology and geographical distribution of the new species are given.

В статье даны описания двух новых видов из рода *Chaetocladius*: *C. (s. str.) coppai* sp. nov. описан по самцу (имаго), *C. (s. str.) diai* sp. nov. – по самцу (имаго) и по куколке. Материал собран у ледниковых альпийских родников и ручейков, находящихся в Приморских Альпах во Франции и в Швейцарских Альпах (*C. coppai* sp. nov.) и на хребте Ливан (*C. diai* sp. nov.). По признакам самца, *C. coppai* sp. nov. относится к группе видов *laminatus*, а *C. diai* sp. nov. близок к *C. elegans* Makarchenko et Makarchenko, 2001. Приведены замечания по таксономическому положению, экологии и распространению новых видов.

Key words: glacial springs, streams, mountains, the Alps, Lebanon, Diptera, Chironomidae, Orthoclaadiinae, *Chaetocladius*, new species

Ключевые слова: ледниковые родники, ручьи, горы, Альпы, Ливан, Diptera, Chironomidae, Orthoclaadiinae, *Chaetocladius*, новые виды

INTRODUCTION

The genus *Chaetocladius* Kieffer, 1911 comprises about 70 valid species worldwide. It was studied mainly in the Palearctic Region (Brundin, 1947, 1956; Pankratova, 1970; Cranston et al., 1989; Moubayed, 1989; Sæther, 1990; Lang-

ton, 1991; Makarchenko & Makarchenko, 2001, 2003, 2004, 2006a, 2006b, 2007, 2009, 2011a, 2011b, 2013a, 2013b, 2013c; Zelentsov, 2007; Stur & Spies, 2011; Ashe & O'Connor, 2012; Kobayashi, 2012; Wang et al., 2012; Sæther & Spies, 2013; Baranov & Przhiboro, 2014; Makarchenko et al., 2014, 2017; Moubayed-Breil, 2017, in press; Moubayed-Breil & Lods-Crozet, 2017, in press). Compared to numerous *Chaetocladius* spe-

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cies described from Far Eastern Russia, only a few new species have been recently described from Europe and bordering areas.

In this paper, we provide the descriptions of two new species of *Chaetocladius* based on the material recently collected at some glacial springs and small streams located in the Maritime Alps, France, and the Swiss Alps (*C. coppai* **sp. nov.**) and at two high mountain springs of Lebanon (*C. diai* **sp. nov.**).

Chaetocladius coppai **sp. nov.** belongs to the *laminatus*-group, which is represented by several sibling species in Europe and neighbouring areas. This species is mentioned as *Chaetocladius* sp. 1 in Moubayed-Breil & Lods-Crozet (2017, in press). Based on some specific characters found in the male adult of *C. diai* **sp. nov.** (shape of anal point, inferior volsella and virga), this new species is keyed near *C. elegans* Makarchenko et Makarchenko 2001 and two other undescribed species from the Swiss Alps (Moubayed-Breil & Lods-Crozet, 2017, in press). At present it is not feasible to provide keys for known male adults until current work on the genus is complete and more material can be examined.

The presence of two new species of *Chaetocladius*, which are possibly confined to high mountain glacial springs and streams, highlights the importance of high mountain ranges considered as hotspots of endemism, in the preservation and persistence of stenotopic and relic species.

MATERIAL AND METHODS

The material was preserved in 80% ethanol and later mounted in polyvinyl lactophenol. For each adult, the head, thorax and abdomen were cleared in 90% lactic acid before mounting on slides.

The pupal abdomen in all members of the genus *Chaetocladius* as well in those of some other genera of Diamesinae and Orthocladiinae is characterized by a complex distribution pattern of armament on both tergites and sternites. Therefore, for a bet-

ter examination of the specific features and for a more accurate description of taxonomic details of armament, the pupal abdomens were mounted not only in dorsal and ventral views but separately in lateral view. This approach enabled us to illustrate the relevant taxonomic characters.

Terminology, abbreviations and measurements follow Sæther (1980) for the imagines, Sæther (1980) and Langton (1991) for pupae.

TAXONOMIC PART

Order DIPTERA

Family CHIRONOMIDAE

Subfamily ORTHOCLADIINAE

Genus *Chaetocladius* Kieffer, 1911

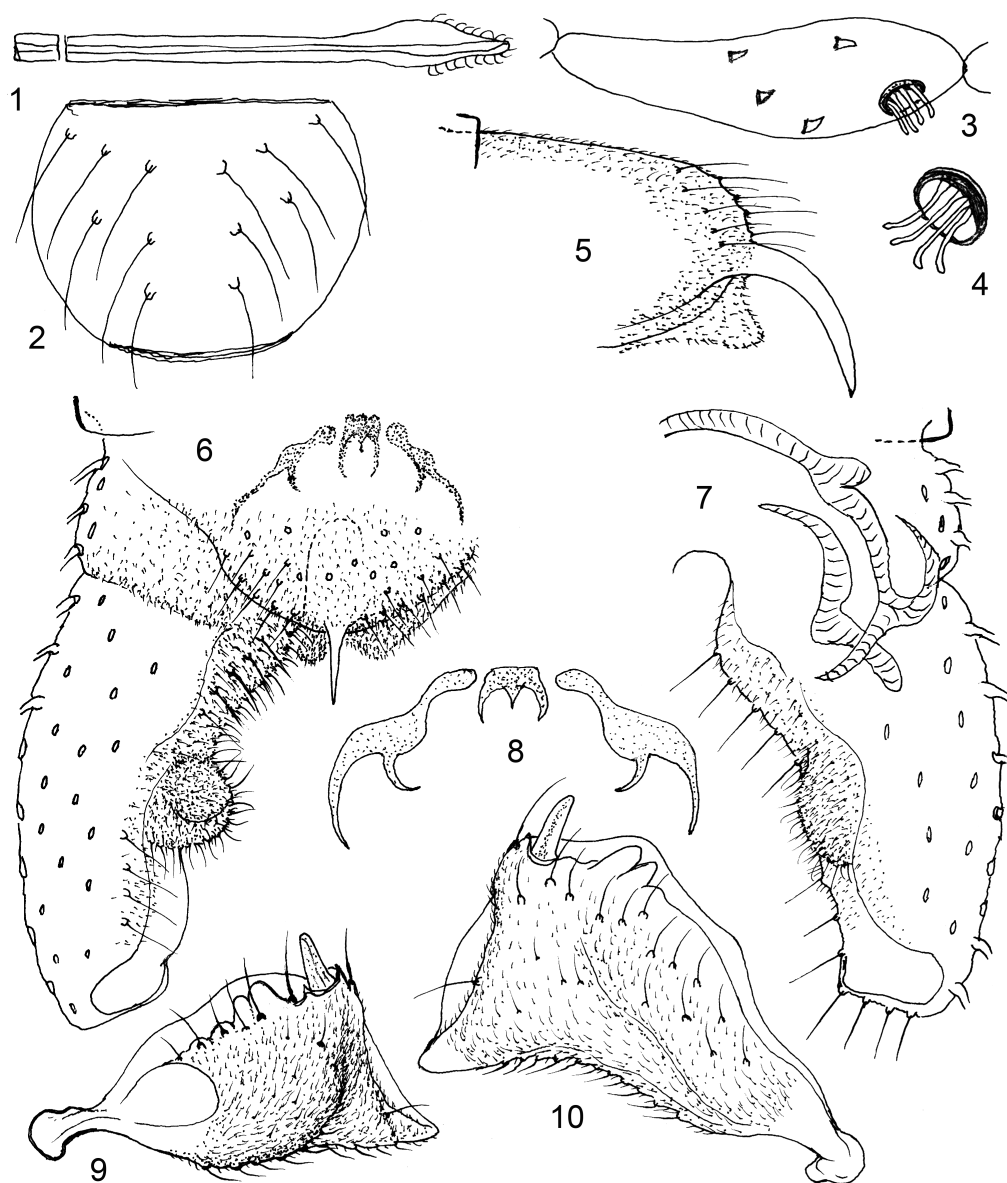
Chaetocladius coppai Moubayed-Breil, **sp. nov.** (Figs 1–10)

Holotype. Male; **France**, Maritime Alps, Fontanalba spring (rheocene and small waterfalls) located below Lake Grenouilles, altitude 1700–1900 m, 22.VI.2016, J. Moubayed leg.

Paratypes. **Switzerland**, Swiss Alps: 1 male, Gletschboden alluvial streamlet and rheocrenes located close to the upper reach of the Rhône River, altitude 1800 m, 23.IX.2001, B. Lods-Crozet leg.

The holotype (mounted on one slide) is deposited in the collection of the National Museum of Ireland (Dublin). The paratype is deposited in the collection of the senior author.

Diagnostic characters. Based on the characters of the adult male, *C. coppai* **sp. nov.** belongs to the *laminatus*-group, which is further described in detail in Moubayed-Breil (2017, in press). It is keyed in particular close to *C. laminatus* Brundin, 1947, *C. dissipatus* (Edwards, 1929), *C. holmgreni* (Jacobson, 1898) and *C. lopatinskiy* Makarchenko et Makarchenko, 2017. However, *C. coppai* **sp. nov.** can be separated from other related species of *Chaetocladius* by the following combination of characters. Clype-



Figs 1–10. *Chaetocladius coppai* sp. nov. (adult male, holotype): 1, ultimate flagellomere; 2, clypeus; 3–4, palpomere 3; 5, abdominal tergite IX and anal point (lateral view); 6–7, abdominal tergite IX and gonocoxite (6, dorsal view; 7, ventral view, tergite IX and anal point removed); 8, virga; 9–10, gonostylus (9, dorsal view; 10, ventral view).

us broadly semicircular with 12 setae placed in 3–4 rows; palpomere 3 with 4–5 sparsely distributed sensilla clavata and 4 tubule-like sensilla clavata in a circular depression placed distally. Lobes of antepnotum not gaping. Legs with sensilla chaetica on tibia

and tarsomeres ta_1 – ta_5 of fore legs and on tibiae and tarsomeres ta_1 – ta_3 of mid and hind legs. Virga consisting of three separated parts, median with three small unequal teeth and lateral parts “Diplodocus-like”. Gonocoxite markedly truncate apically in

both dorsal and ventral view; inferior volsella semicircular to broadly rounded, without contrasting elements, without an inner beak-like apex and distal marsupial pouch-like lobe. Gonostylus triangular, somewhat swollen medially, markedly projecting posteriorly to a pointed apex, with two characteristic smooth subequal teeth placed close to the megaseta and prolonged by an undulated row of setae; crista dorsalis specifically typical, long and low, bearing two moderately swollen lobes placed medially and preapically.

Description. *Male adult* (n = 2; for legs, n = 1). Medium to small-sized: total length 3.70–3.80 mm. Wing length 1.10–1.20 mm. Body coloration contrasting brown to dark brown. Head dark brown; antennae pale brown; thorax contrasting brown to dark brown, mesonotal stripes distinctly dark brown. Wing pale. Legs brown to dark brown. Abdominal tergites I–IV brownish, tergites V–VIII and anal segment dark brown.

Head. Eyes bare, hairs absent on inner lateral eye margin. Temporals 14–17 including 8 uniserial inner and 6–9 outer verticals. Antenna 1200–1220 µm long, 13-segmented; ultimate flagellomere 710–720 µm long, distinctly clubbed distally and bearing a dense brush of curved sensilla chaetica apically; apex (Fig. 1) lacking preapical setae; antennal groove beginning on segments 3–4 and reaching ultimate flagellomere; AR 1.60–1.70. Clypeus (Fig. 2) about 130 µm in maximum height and 175 µm in maximum width, nearly semicircular, with 12 setae arranged in 3–4 rows. Palp 5-segmented, segments 1 and 2 fused

and unequal, segments 3 and 4 nearly subequal; length of segments (in µm): 50, 70, 91, 90, 135; palpomere 3 (Figs 3–4) with 4–5 sparsely distributed sensilla clavata and 4 sensilla clavata grouped in a characteristic circular depression placed distally.

Thorax. Anteprenotum well-developed, with lobes not gaping; lateral anteprenotals 5, grouped close together; acrostichals 11–12, minute, uniserial; dorsocentrals 10 in one row, prealars 3, supraalars absent. Humeral pit well-developed, subcircular, with several small contrasting spots. Scutellum with 6–7 setae arranged in one row.

Wing. Brachiolium with one seta. Number of setae on veins: *R*, 14–18; *R*₁, 2–9; remaining veins bare. Squama with 13–17 uniserial setae.

Legs. Sensilla chaetica present on tibia and tarsomeres ta₁–ta₃ of fore legs, on tibia and tarsomeres ta₁–ta₃ of mid and hind legs. Lengths of tibial spurs (in µm): 90 (p₁); 45 and 33 (p₂); 71 and 30 (p₃). Lengths (in µm) and proportions of legs as in Table 1.

Hypopygium in dorsal and ventral views as in Figs 6 and 7. Tergite IX semicircular, slightly narrowed posteriorly, with 25–27 dorsal setae. Anal point about 30–35 µm long, 20–25 µm wide at base, in dorsal view triangular and pointed apically (Fig. 6), in lateral view markedly bent downwards as a pointed beak (Fig. 5). Virga (Fig. 8) consisting of three separated parts: median one with three small unequal posterior teeth, two lateral parts “Diplodocus-like”. Gonocoxite (Figs 6, 7) distinctly truncate apically in both dorsal and ventral view. Inferior volsella subcircular to broadly rounded apically, 35–40 µm in maximum

Table 1. Lengths (in µm) and proportions of legs in *Chaetocladius coppai* sp. nov.

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
p ₁	1070	1225	860	490	340	210	135	1.15	2.69	4.25	2.0
p ₂	1115	1140	540	330	245	205	125	1.02	3.09	4.18	3.0
p ₃	1220	1310	810	455	330	175	140	1.07	3.04	3.12	3.85

length, 25–30 μm in maximum width, without contrasting elements: without inner beak-like apex and distal marsupial pouch-like lobe. Gonostylus (Figs 9, 10) 125–130 μm long, 80–85 μm in maximum width, typically triangular, moderately to strongly swollen medially, markedly projecting posteriorly at a nearly pointed apex, with two characteristic smooth teeth on inner margin close to megaseta, and a dorsal row of setae (Fig. 9) extending parallel to inner margin; crista dorsalis about 50–60 μm long, consisting of two low, moderately swollen lobes placed medially and preapically.

Taxonomic position. *Chaetocladius coppai* **sp. nov.** is close to *C. dissipatus*, *C. holmgreni* and *C. egorych* Makarchenko et Makarchenko, 2017 from which it can be separated in having palpomere 3 distinctly swollen and rounded apically, with 4–5 sparsely distributed sensilla clavata and 4 tubule-like sensilla clavata grouped in a characteristic ring-like structure placed distally; tergite IX semicircular with 25–27 dorsal setae; anal point triangular, slender and sharply pointed apically; gonocoxite with truncate apex; gonostylus triangular, sphaerical medially, markedly projecting posteriorly to a nearly pointed apex, with two characteristic smooth teeth placed close to the megaseta and prolonged by an undulated row of setae; crista dorsalis long and low, bearing two moderately swollen lobes placed medially and preapically.

Etymology. The new species is named *coppai* after my colleague Gennaro Coppa who remains an active entomologist studying the taxonomy and biogeography of Trichoptera, in appreciation of his kind assistance and sharing the material of Chironomidae from his collection.

Distribution and bionomics. *Chaetocladius coppai* **sp. nov.** is known from the Maritime and Swiss Alps, only at lotic habitats delimited by cold glacial rheocrenes and streams, at an altitude of about 1700–1800 m. We suppose that it is a crenobiontic relic species.

The Fontanabla spring (sampling site of the holotype) is characterized by calcareous water, with conductivity of 95–100 $\mu\text{S}/\text{cm}$ and temperature of 8–10°C in late June. The Rhône River at the sampling site of the paratype is characterized by crystalline water, with conductivity of 61–183 $\mu\text{S}/\text{cm}$ and temperature of 4.5–14°C from late spring to late summer (June – September). We suppose that emergence occurs from early summer to late autumn.

The associated species of Chironomidae encountered in the sampling localities are *Boreoheptagyia rugosa* (Saunders, 1930), *Diamesa aberrata* Lundbeck, 1889, *D. cinerella* Meigen, 1835, *D. goetghebueri* (Pagast, 1947), *D. latitarsis* (Goetghebuer, 1921), *D. modesta* Serra-Tosio, 1968, *Pseudodiamesa branickii* (Nowicki, 1873), *Syndiamesa edwardsi* (Pagast, 1947), *Chaetocladius perennis* (Meigen, 1830), *C. suecicus* (Kieffer, 1916), *Thienemannia corsicana* Moubayed-Breil, 2013, and *Micropsectra roseiventris* (Kieffer, 1909).

***Chaetocladius diai* Moubayed-Breil, sp. nov.**

(Figs 11–29)

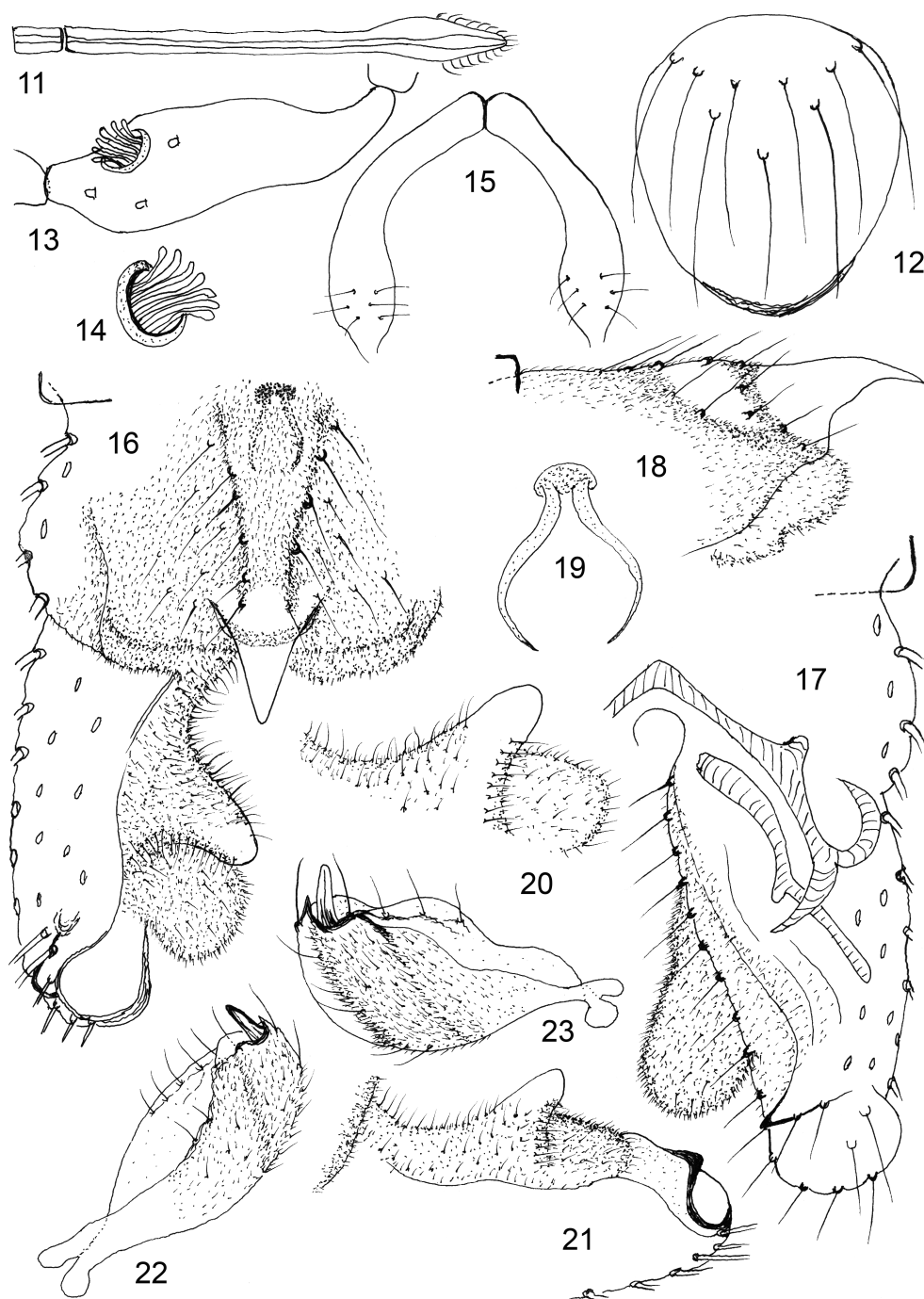
Holotype. Male (pharate adult and its pupal exuviae); **Lebanon**, Mount Lebanon range, Hammana-Falougha springs at Sannyn Mount, altitude 1700–1800 m, 5.VIII.2005, J. Moubayed-Breil leg.

Paratypes. **Lebanon:** 1 male, Mount Lebanon range, Barook springs and stream at Barook Mount, altitude 1800 m, 07.IX.2001, A. Dia leg.

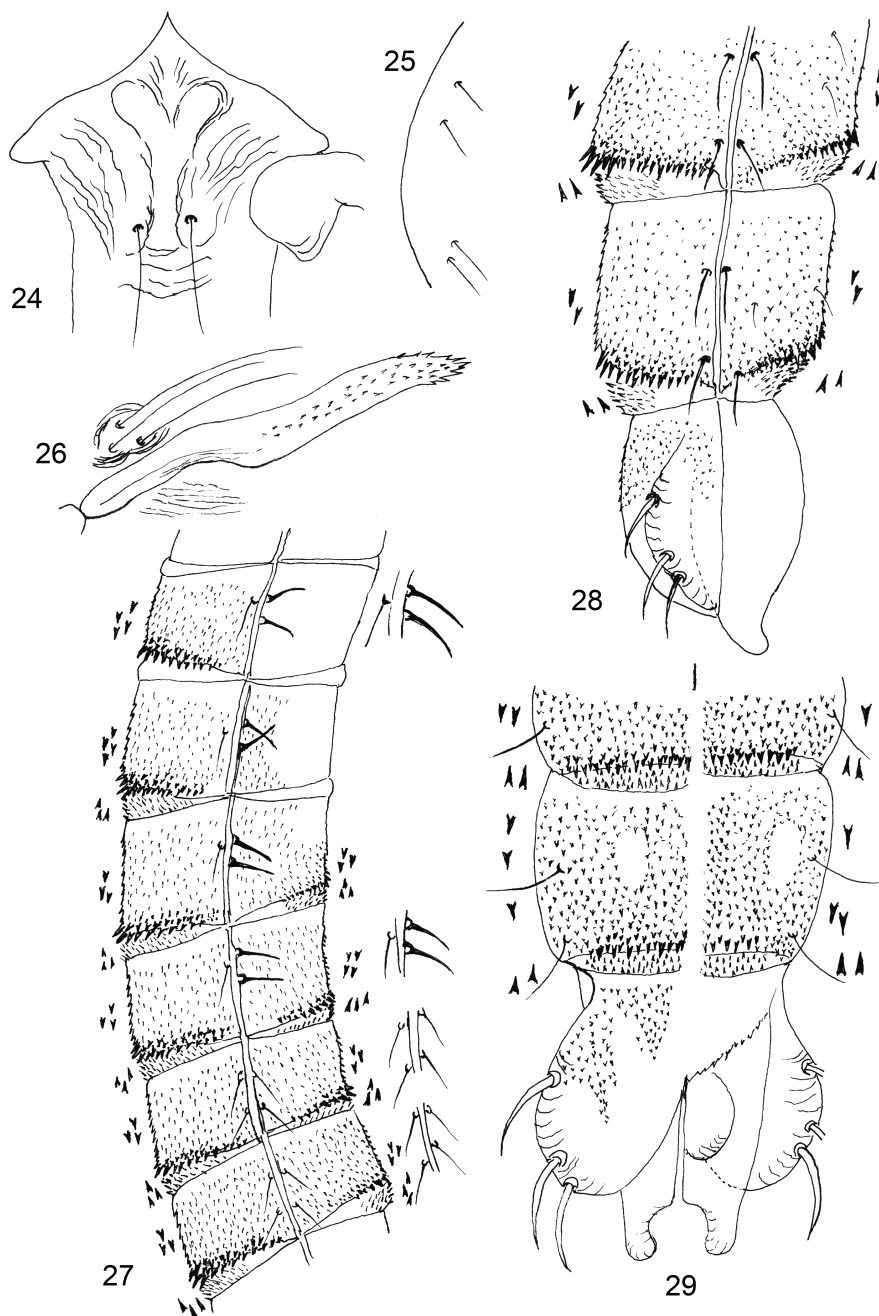
The holotype (mounted on two slides) is deposited in the collection of the National Museum of Ireland (Dublin). The paratype is deposited in the collection of the senior author.

Diagnostic characters. Male adult and pupal exuviae of *C. diai* **sp. nov.** can be distinguished from all species of *Chaetocladius* by a combination of characters.

In the male adult, last flagellomere of antenna lacking preapical seta; palpomere 3 bearing 6–7 tubule-like sensilla clavata which are grouped on a circular structure;



Figs 11–23. *Chaetocladius diai* sp. nov. (adult male, holotype): 11, ultimate flagellomere; 12, clypeus; 13–14, palpomere 3; 15, antep pronotum; 16–17, abdominal tergite IX and gonocoxite (16, dorsal view; 17, ventral view, tergite IX and anal point removed); 18, abdominal tergite IX and anal point (lateral view); 19, virga; 20, inferior volsella (lateral view); 21, gonocoxite with inferior volsella (lateral view); 22–23, gonostylus (22, lateral view; 23, dorsal view).



Figs 24–29. *Chaetocladius diai* sp. nov. (male pupal exuviae): **24**, frontal apotome; **25**, arrangement of dorsocentrals on thorax; **26**, thoracic horn; **27**, abdominal segments II–VII (lateral view); at left and right side of segments, details of armament (enlarged) on tergites, sternites and conjunctives; at right side of segments, details of lateral setae; **28**, distal part of abdominal segment VII, segment VIII and anal segment (lateral view); at left and right side of segments, details of armament (enlarged) on tergites, sternites and conjunctives; **29**, distal part of abdominal segment VII, segment VIII and anal segment (left, dorsal view; right, ventral view); at left and right side of segments, details of armament on tergites, sternites and conjunctives.

lobes of anteprenotum not gaping; sensilla chaetica absent on fore and mid legs, present on tarsomeres ta_1 – ta_5 of hind legs; tergite IX contrasting (dark brown to whitish), with two distinct longitudinal rows of dorsal setae abruptly terminated at base of anal point; anal point in dorsal view widely triangular with short rounded apex, in lateral view sharply pointed; gonocoxite rounded apically, its ventrolateral side with a triangular tubercle projecting inwards; inferior volsella consisting of two parts, proximal one long nose-shaped with hyaline bare apex, and distal one marsupial pouch-like nearly reaching apex of gonocoxite; gonostylus bulbous with rounded posterior margin which is bare and hyaline in its distal half; crista dorsalis entirely hyaline, sinuate in dorsal view, its proximal part bare, distal part with a row of 4–5 setae.

In the pupal exuviae, frontal apotome domed and heavily wrinkled, frontal tubercles small but distinct, frontal setae inserted on prefrons ventral to antennal sheath. Dorsocentrals nearly subequal, Dc2 placed close to Dc1 and Dc3 closer to Dc4. Thoracic horn unusually shaped, distinctly sinuous and linearly elongated, moderately toothed on its distal half; precorneals subequal. Tergite I and sternites I–II bare. Tergites II–VIII entirely covered with dense spinulae; sternites III–V partly covered, VI–VIII entirely covered with dense spinulae (smaller than on tergites). Posterior transverse rows of spines present on tergites II–VIII and sternites IV–VIII; distal parts of tergites II–VIII and of sternites III–VIII bearing rows of short spinulae variably projecting orally and posteriorly. Lateral setae on segments I–VIII consisting of two types: a (spine-like setae) and b (usual type setae); segment I with two setae (b-type); segments II–V with three setae (two a-type and one b-type); segment VII–VIII with two setae (b-type). Male genital sac with only one apical swollen lobe; macrosetae about 75 μ m long and spine-like, two distal spines placed close together, distance between the two anterior spines 80 μ m.

Description. *Male adult* ($n = 2$; for leg measurements, $n = 1$; Figs 11–23). Medium to large-sized *Chaetocladius* species. Total length 4.25–4.35 mm. Wing length 1.85–1.90 mm. General coloration contrasting yellowish brown to dark brown. Head dark brown; antennae brownish; thorax contrasting yellowish brown to dark brown, mesonotal stripes distinctly dark brown; wing pale; legs brownish. Abdominal tergites I–VIII and brown to dark brown; anal segment contrasting dark brown to whitish in both dorsal and ventral views; inferior volsella markedly contrasting: dark brown to whitish, with proximal part brown to dark brown and distal part whitish.

Head. Eyes bare, hairs absent on inner eye margin. Temporals consisting of 14 setae including 9 inner and 5 outer verticals, inner verticals arranged in two rows. Antenna 1110 μ m long, 13-segmented, markedly linear and thick, 30–35 μ m in maximum width; segments 1 to 12 subequal, well-separated; ultimate flagellomere (Fig. 11) 605 μ m long; apex of last flagellomere moderately clubbed, bearing numerous sensilla chaetica and lacking a preapical seta; antennal groove beginning on segment 5 and reaching ultimate flagellomere; AR 1.2. Clypeus (Fig. 12) 130 μ m in maximum length, 12 μ m in maximum width, distinctly oval, with rounded sides, bearing 9 setae in 3–4 rows. Palp 5-segmented; length of segments 1–5 (in μ m): 30, 32, 125, 120, 175; palpomere 3 (Figs 13–14) with 3 sparsely distributed sensilla clavata and 6–7 sensilla clavata grouped in a characteristic circular depression in distal part.

Thorax. Anteprenotum (Fig. 15) well-developed, with anteprenotal lobes not gaping. Lateral anteprenotals 5–6, grouped close together; acrostichals numerous, short, starting close to anteprenotum and arranged in one row; dorsocentrals 12, uniserial; prealars 4, arranged in one row; supraalars absent. Humeral pit ovoid, without contrasting spots. Scutellum with 8 uniserial setae.

Wing. Brachiolum with one seta. Numbers of setae on veins: *R*, 17; *R*₁, 2–3; re-

Table 1. Lengths (in μm) and proportions of legs in *Chaetocladius diai* sp. nov.

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
p ₁	830	855	590	330	265	195	135	1.03	2.46	2.86	2.0
p ₂	895	860	425	265	215	145	130	0.96	2.89	4.13	1.70
p ₃	1075	885	610	360	245	180	150	0.82	2.75	3.21	1.30

maining veins bare. Squama with 10–11 uniserial setae.

Legs. Length of tibial spurs (in μm): 70 (p₁); 30, 15 (p₂); 75, 30 (p₃). Sensilla chaetica absent on fore and mid legs, present on tarsomeres ta₁–ta₅ of hind leg. Lengths (in μm) and proportions of legs as in Table 2.

Hypopygium in dorsal and ventral views as in Figs 16 and 17. Tergite IX 160–170 μm in maximum width, broadly subrectangular with nearly straight posterior margin (Figs 16), with two distinct longitudinal rows of dorsal setae abruptly terminating at base of anal point. Anal point 80–85 μm long, 30 μm wide at base, in dorsal view widely triangular and short, with apex rounded (Fig. 16), in lateral view sharply pointed (Fig. 18); 1–2 setae present at base, remaining part entirely bare and hyaline. Laterosternite IX rounded, with 6–7 setae on either side. Transverse sternapodeme wide, V-shaped, with distinct oral projections; phallapodeme slender and linearly elongated up to joint with lateral sternapodeme. Virga (Figs 16, 19) faintly visible, consisting of two long spines about 45 μm long fused at base. Gonocoxite 260–270 μm long, rounded apically, distal part with a distinct projecting triangular tubercle placed ventrolaterally (Figs 17, 21). Inferior volsella (Figs 16, 20, 21) about 85 μm long and 43 μm in maximum width, consisting of two parts: proximal long dark brown, nose-like, with hyaline bare apex, and distal whitish, marsupial, pouch-like, projecting downwards and nearly reaching apex of gonocoxite. Gonostylus (Figs 22–23) about 100–110 μm long, 50 μm in maximum width, massively bulbous medially; anterior margin sinuate,

posterior margin rounded with hyaline distal half visible in dorsal view (Fig. 23); crista dorsalis entirely hyaline, sinuate in dorsal view (Fig. 23), consisting of two unequally sized humps (distal one smaller), rounded in lateral view (Fig. 22); proximal part bare, distal part bearing a row of 4–5 setae.

Male pupal exuviae (n = 1, Figs 24–29). Total length 4.40 mm. As in many *Chaetocladius* pupal exuviae, that of *C. diai* sp. nov. markedly pale to transparent except for posterior transverse rows of spines on tergites and sternites; frontal apotome strongly wrinkled, cephalothorax with faint wrinkles near base of thoracic horn and between Dc₂ and Dc₃; abdomen, anal segment and genital sacs a little darker than remaining parts of exuviae.

Frontal apotome (Fig. 24) domed; frontal tubercles small but distinct; frontal setae 115 μm long, inserted on prefrons ventral to antennal sheath; distance between setae 40 μm . Dorsocentrals (Fig. 25) subequal, about 40 μm long, Dc₂ placed close to Dc₁ and Dc₃ closer to Dc₄; distance between Dc₁ and Dc₂ 55 μm , Dc₂ and Dc₃ 145 μm , Dc₃ and Dc₄ 15 μm . Thoracic horn (Fig. 26) 235 μm long, markedly sinuate, linearly elongated, thin at base (15–20 μm wide), becoming thicker in its distal two-thirds (30–35 μm wide), moderately toothed in distal half; precorneals subequal, about 170–175 μm long.

Abdomen (Figs 27–29). Armament and distribution pattern of shagreen, patches of spinulae and points, chaetotaxy and lateral setation of abdominal segments II–VIII and anal segment as illustrated in Figs 27–29 (tergites and sternites). Tergite I and ster-

nites I–II bare. Tergites II–VIII entirely covered with dense spinulae; sternites III–V partly covered, VI–VIII entirely covered with dense spinulae (smaller than on tergites). Posterior transverse rows of spines present on tergites II–VIII and sternites IV–VIII; distal parts of tergites II–VIII and of sternites III–VIII bearing rows of short spines variably projecting orally and posteriorly. Lateral setae on segments I–VIII consisting of two types, a (spine-like setae) and b (usual type setae). Distribution pattern of lateral setae on abdominal segments as in Figs 27–29: segment I with two setae (b-type); segments II–V with three setae (two a-type and one b-type); segments VII–VIII each with two setae (b-type). Pedes spurii B absent. Male genital sac (Figs 28, 29) 400 µm long, with an apical swollen lobe, projecting outside apical margin of anal lobe by 60 µm. Macrosetae about 75 µm long, spine-like, subequal and long; two distal macrosetae close to each other; bases of two anterior macrosetae separated by 80 µm.

Taxonomic position. Male adult. Based on the similar shape of both tergite IX and anal point, the male adult of *C. diai* sp. nov. can be keyed near that of *C. elegans* Makarchenko et Makarchenko, 2001. However, *C. diai* sp. nov. is easily separated by the following combination of characters: legs with sensilla chaetica absent on fore and mid legs, present on tarsomeres ta_1 – ta_5 of hind legs; tergite IX contrasting dark brown to whitish, bearing two distinct longitudinal rows of dorsal setae abruptly terminated at base of anal point; anal point in dorsal view widely triangular with rounded short apex, in lateral view sharply pointed; gonocoxite rounded apically, ventrolateral side bearing a triangular tubercle projecting inwards; inferior volsella consisting of two parts: proximal one long nose-shaped with hyaline and bare apex, distal one marsupial pouch-like projecting downwards and nearly reaching apex of gonocoxite; gonostylus bulbous with rounded posterior margin, which is bare and hyaline in its distal half; crista dor-

salis entirely hyaline, sinuous in dorsal view, proximal part bare, distal part bearing a row of 4–5 setae.

Pupal exuviae. An unusual shape of thoracic horn represents the strongest distinguishing character to separate the pupal exuviae of *C. diai* sp. nov. from those of other known pupae in the genus *Chaetocladius*. Nevertheless, a combination of differentiating characters found in the male pupal exuviae includes frontal apotome domed and heavily wrinkled, frontal tubercles distinct, frontal setae inserted on prefrons ventral to antennal sheath. Dorsocentrals nearly subequal, Dc2 placed close to Dc1, and Dc3 much closer to Dc4. Thoracic horn distinctly sinuous and linearly elongated. Tergite I and sternites I–II bare. Tergites II–VIII entirely covered with dense spinulae; sternites III–V partly covered, VI–VIII entirely covered with spinulae. Lateral setae on segments I–VIII consisting of two types, a (spine-like setae) and b (usual type setae); segment I with two setae (b-type); segments II–V with three setae (two a-type and one b-type); segments VII–VIII each with two setae (b-type). Male genital sac with only one apical swollen lobe. Macrosetae long, spine-like, two distal spines placed close together, distance between two anterior spines 80 µm.

Etymology. The new species is named *diai* in honour of Dr. Aref Dia (Lebanese University, Beirut), who is recently retired. He currently remains active in contributing to preservation of the biological quality of aquatic habitats and endemism in Lebanon.

Distribution and bionomics. *Chaetocladius diai* sp. nov. is known only from the upper basin of some rivers in the Mount Lebanon range, western part of Lebanon, from glacial stenothermic rheocrenes and streams. We suppose that it is a crenobiontic relic species. The springs and stream at sampling sites of the holotype and the paratype are characterized by typically calcareous water, with conductivity more than 300 µS/cm, temperature of 4–8 °C during spring and 8–12 °C during summer. We suppose that

emergence occurs from April–May till early August.

The associated species of Chironomidae encountered in the same localities are *Boreoheptagyia rotunda* Serra-Tosio, 1983, *Diamesa kasymovi* Kownacki et Kownacka, 1973, *D. sakartvella* Kownacki & Kownacka, 1973, *D. tonsa* (Walker, 1856), *Pseudodiamesa nivosa* (Goetghebuer, 1928), *Chaetocladius piger* (Goetghebuer, 1913), *Eukiefferiella fittkaui* Lehmann, 1972 and *E. minor* (Edwards, 1929).

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Editorial note:

The Editorial Board of *Zoosystematica Rossica* does not agree with some parts of this paper, in particular with the contents of the two sections entitled *Taxonomic position*, which essentially duplicate the sections *Diagnostic characters* and *Description*. However, we have considered that it is possible to publish the paper in this form, as an exception.